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Power Consumption Reduction by Smart Control of Highway Lighting

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Abstract: *Consumption of power by highway lights constitutes a big component of the total power usage of a country. In a country like India where the majority of the transport is by road and with one of the largest road network the power consumption by highway lighting has to be controlled. We can see in the present scenario that the lights are manually switched ON/OFF or in some stretches automatic switching ON/OFF based on daylight detection is being done. We can see that the lights were ON, when there was no vehicle in a particular stretch. Switching OFF the light when there are no vehicles would results in great savings of power. Our proposed system does this by detecting vehicles on the road and switching ON the lights. We are proposing a system wherein the lights gets switch ON when a vehicle is detected. It remains ON for a present period of time and gets switched OFF. When the vehicle passes the next detector the corresponding light gets switched ON and so on. We are sure that this system when implemented would result in huge savings in the current consumption*

Keywords: *Power Consumption, Smart Highway Lighting, IR and LDR Sensors, LED, Vehicle Detection Introduction.*

I. INTRODUCTION

In a country like India, power crisis is the major problem. Still most of the villages and rural areas were not privileged with the full access of electricity. Rather in urban areas and metropolitan cities more power wastages was happening, like street lights, highway lights and etc. By taking the highway lights and street lights were lit up during the day time because of the manual operation of switching control. If we automate the street lights with the controller, it would save enormous power that can be used for the further development of the country. By proposing the model of automatic control, it would reduce the most of human efforts in maintaining the street light and highway light operation.

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The system proposed will switch ON the lights when the vehicle passes and were turns OFF light when there was no vehicle passing.

II. P PROPOSED HIGHWAY INTELLIGENT SYSTEM

The proposed system automatically detects the vehicles on the road and switching ON the lights and switching OFF the light when there are no vehicles for a considerable period of time. For a day time lights should be closed by using the LDR sensors. Light gets switch ON when a vehicle is detected. It remains ON for a preset period of time and gets switched OFF. When the vehicle passes the next detector the corresponding lights get switched ON and so on.
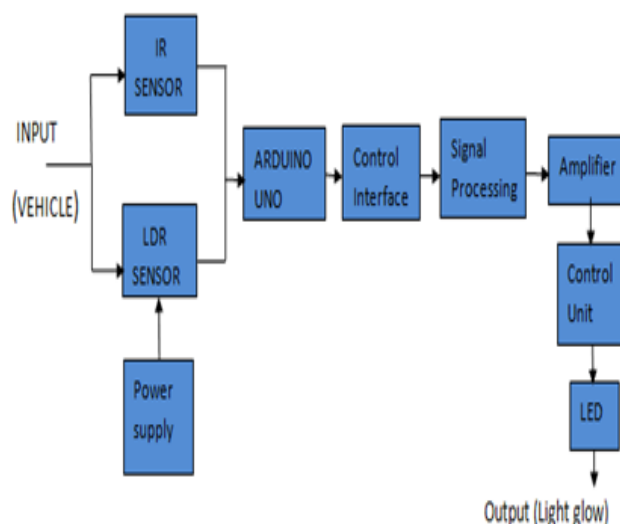

Block diagram of intelligent highway lighting system

This system includes IR sensor and LDR sensor Arduino UNO, and LED lights. The main purpose of Arduino used in this system is to control the switching ON/OFF of the LED. IR sensor place on highways to detects the movement of vehicles. LDR sensors are use in this to avoid the switching ON lights in daytime.

When the vehicles passes IR sensors detect the signal and sends the signal to controller to switching ON/OFF the lights. It remains on for the preset period of time and gets switched OFF. When the vehicle passes to the next detector the corresponding light gets switched ON.

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III. RESULT AND DISCUSSION

This model aimed to reduce the effect of current highway lighting system to conserve the power wastages. The first thing was to prepare the input and output of the system for controlling the highway lights operation.
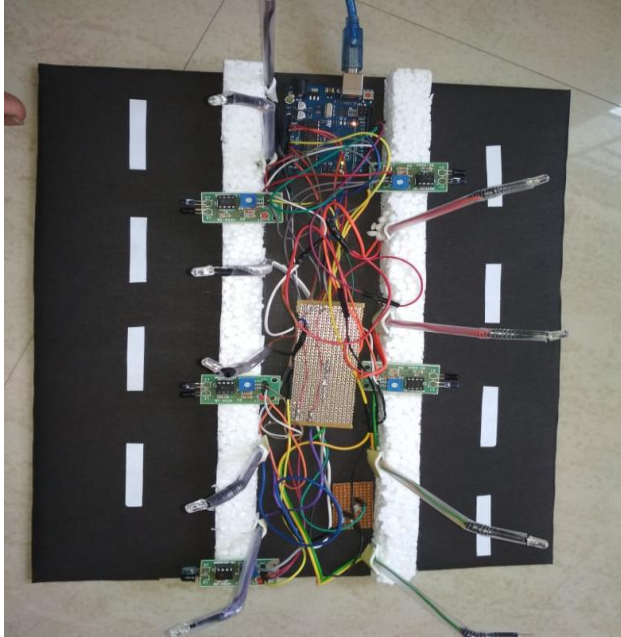

Model Highway Lighting System

The above mentioned model has been constructed with the hardware arrangements of the LDR sensors, IR sensors, LED (Lighting device), AURDINO for controlling the sensors.
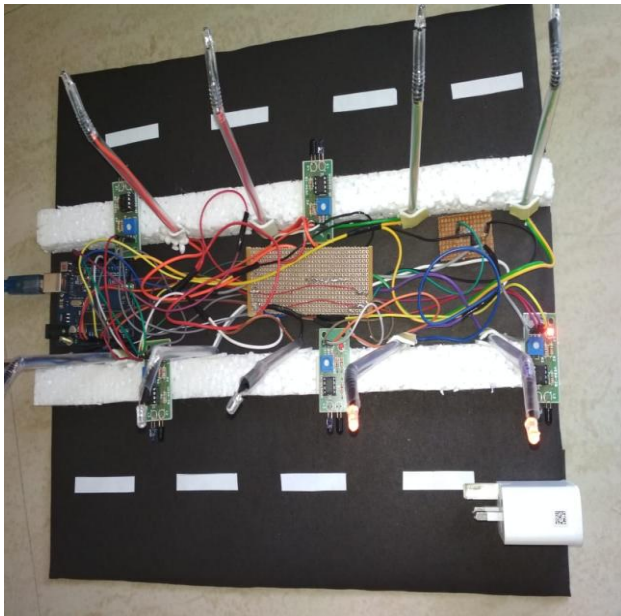
Mode of operation when vehicle detected

When movement of vehicle is not detected, the lighting devices will be in OFF state. At this point when there is vehicle movement on road, the block of lights are turned ON for some milliseconds and they will be turned OFF (First two LEDs) when the vehicle passes from the range of the first sensor. From the above Fig.7.2 we are able to see the mode of operation when the sensors detect the movement of the vehicle and the lighting device delivers the light.
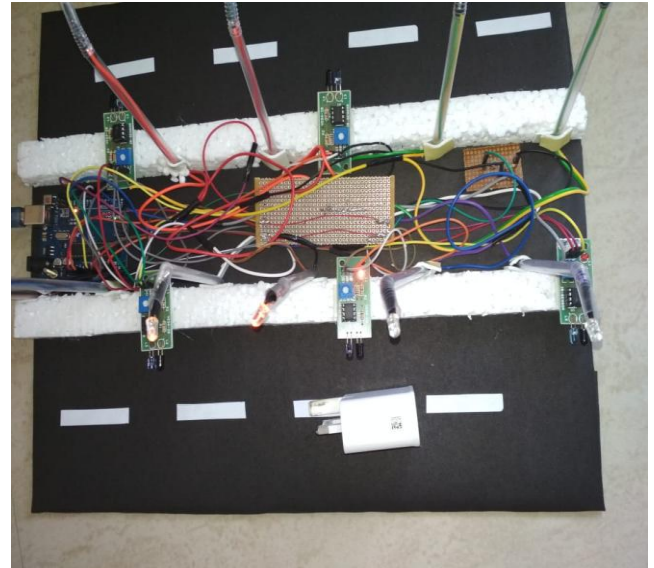
Mode of operation when vehicle moves forward

The vehicle when moved forward, the trailing LEDs will get OFF and the second sensor will detect the vehicle and the next two LEDs ahead of the vehicle will deliver the light. The same process happens again ahead and thus the trailing lights will get OFF and the lights ahead will get ON.

The above figures shows the complete working prototype of the IOT based smart highway lighting system which includes LDR, IR SENSOR, AURDINO, and LED.

IV. CONCLUSION

In our proposed model of intelligent highway lighting system, it accurately verifies that IR sensors detect the movement of vehicles and switching ON/OFF of LED at a night time. By using power consumption reduction by smart highway lighting, we can save more amount of electrical power and more conservation is possible by replacing sodium vapour lamps by LED. It provides a smart and efficient automatic highway light control system with the help of IR sensor and LED sensor. LED should not switch ON before sunset. It can be extended further for Indian two way traffic systems and should more flexible with the seasonal changes.

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